

Blue= EPA

Red=CEI

Slide 1 Title      “How New Methods of Nitrogen Treatment for Stormwater are Designed to Help Cape and Other Coastal Communities Meet Nitrogen TMDLs”

Slide 2            Program Background: big picture stuff

Slide 3            EPA South Coast Approach

Slide 4            The Team and Stakeholders: (Team: EPA-> lead, funding source, outreach; WaterVision-> project management, sampling expertise; CEI-> designer, construction/oversight. Stakeholders: Barnstable/Chatham and associated departments, Cape Cod Commission, MassDEP, Association for the Preservation of Cape Cod, neighborhood associations).

Slide 5            Selection Process: (Must be within watersheds of waterbodies draining to Nantucket Sound. Should be town-owned properties with existing drain system, bigger the better. Sites publicly accessible/visible).

Slide 6            Selected Sites: (Barnstable: Gateway marina/Hyannis Inner Harbor park area, drains to Hyannis Inner Harbor impaired for TN and Fecal. Chatham: parcel in residential area, drains to Oyster Pond impaired for TN and Fecal.)

Slide 7            Design and Site Constraints- Barnstable: (6.9-acre contributing watershed, 3.5-acres impervious. Constraints: very shallow groundwater ~1-foot deep and must be lined, park area, high traffic walkway to ferry, available space constrained by walkway and property bounds, tidal concerns. Figure showing aerial of site).

Slide 8            Design and Site Constraints- Chatham: (16.9-acre contributing watershed, 5.7-acres impervious. Constraints: shallow groundwater ~2-feet deep and must be lined, nearby wetlands with resource areas/permitting concerns, available space constrained by wetlands, deep existing drain line. Figure TBD, aerial will just show trees. Maybe show picture of outlet pipe or Oyster Pond).

Slide 9            Chosen BMP Design and General Function: (hybrid bioretention and gravel wetland system. Combines aesthetics of bioretention system with storage and treatment capacity/ability of gravel wetland. Figure of general cross section w/plants in loam/seed on top, separation liner, gravel reservoir, and bottom liner).

Slide 10           Design Parameters and Sizing: (Per UNH, much of TN is contained in very small storms, approx. 80% in first 0.2-0.4-inch storm. Based on available room at each site, can store and treat 0.3-inch storm. Note must be designed to store volume in underground stone reservoir. Maybe include figure/graph from UNH).

Slide 11           Treatment Science: (Designed to mimic part of the nitrogen cycle. Stormwater comes in, microorganisms convert some nitrogen into ammonia via nitrogen fixation. Ammonia absorbed into plant roots or converted into nitrates and nitrites via nitrification process. Oxygenated nitrites and nitrates infiltrate into soils in anaerobic conditions where microorganisms convert nitrogen components

to nitrogen gas via denitrification, which is ultimately released to the air when stormwater exits BMP. Figure of nitrogen cycle).

Slide 12        Schematic Layout- Barnstable: (Figure by CEI, probably a couple minutes on this slide)

Slide 13        Schematic Layout- Chatham: (Figure by CEI, probably a couple minutes on this slide)

Slide 14        Construction Pics 1- Barnstable: (Existing conditions, excavation, tie into ex. drain line)

Slide 15        Construction Pics 2- Barnstable: (Install liner and gravel, loam and final grading)

Slide 16        Construction Pics 3- Barnstable: (Planting, final results)

Slide 17        Construction Pics 1- Chatham: (Clearing, excavation, liner and gravel)

Slide 18        Construction Pics 2- Chatham: (Loam and final grading, tie into ex. drain line)

Slide 19        Construction Pics 3- Chatham: (Planting, final results)

Slide 20        Construction Costs and Anticipated BMP Performance: (Barnstable: ~\$107,000. Chatham: ~\$213,000. Cost per pound of TN removed, cost per acre of IA treated).

Slide 21        Scheduling: (Tourist season, schedule a concern at both sites. Barnstable in spring because high profile downtown, don't want to block path and park during busy season. Chatham in summer and early fall since in quiet residential area, however road work done in fall for boat ramp).

Slide 22        Monitoring Program/Schedule: (Let BMPs seed/establish over ~1-year, then install monitoring equipment: inlet to BMP, outlet from BMP, existing drainage system bypass. Sample each for flow and nutrients with auto-samplers and volunteers). Any other or different monitoring discussion and extra slides as needed.

Slide 23        Closing and Questions?